

[dstl]

Bridging the land-sea interface



Outline

- What is the problem?
- Requirements definition
 - Analysis of port facilities
- Options assessment
 - Analysis approach
- Summary



What is the problem?

- Offload at desired location
- Facilities may not be available
 - Well found port – all facilities required for offload
 - Additional equipment to offload through non-well found (austere) port
- Likelihood of using an austere port?
- What equipment / technology will enable offload?
- Firstly, what we mean by austere...



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Requirements definition



Port austerity scale

- Traditionally, 4 point scale:
 - Well found
 - Austere
 - Bare base
 - Beach
- “Austere” used to describe wide range of port capabilities
- Therefore, proposed an austerity scale with better granularity



Austerity definitions

- List of factors affecting port austerity agreed through military judgement
 - Approach (anchorage, fairway depth and width)
 - Berthing (jetty space, slipway, RoRo berths)
 - Offload (cranes, container handling, mechanical handling equipment, marshalling area, main supply routes)
- Threshold values for these factors defined at each level
- Separate austerity scales defined for container and vehicle offload capabilities

Other factors affecting port access

- Austerity levels calculated based on fixed facilities
 - There are other variable factors that have an impact on austerity
 - Number of these factors identified
 - Effect of these will be addressed in analysis
- Factors identified:
 - Enemy occupation
 - Enemy denial
 - Asymmetric threat
 - Political unrest
 - Excessive demand
 - Commercial priority
 - Accident
 - Weather
 - Tides
 - NEQ limit

Ports database

- Need to understand requirement to offload in ports of varying austerity levels
- Therefore, need to understand capabilities of ports that may be used to offload shipping
- Databases of available ports and descriptions of their facilities are available, but no assessment of utility
- Therefore, new database compiled which assesses ports against austerity level definitions

Example of ports database

Ports Database Version 1.6 (Final) NOT FOR OPERATIONAL USE

Map Legend

2. Select a Country
France

3. Select an Initial Port
Boulogne
Brest
Caen
Calais
Calvi
Cannes

4. Input a Range (750km Max)
 Ports 250
 Airports 100
[Calculate Entries within Range]

Map Zoom + -

EXIT

Ports within Range View Provisional Scores

Port	Country	Distance	ALV	ALC
Caen	France	0		
Ouistreham	France	12		
Courseulles S...	France	16		
Port En Bessin	France	34		
Trouville Deau...	France	35		
Le Havre	France	47		
Honfleur	France	50		
Isigny	France	56		

Airports within Range

Airport	Country	Distance
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Distance from UK

Approach Scores
Berthing Scores
Offload Scores
Information Only
Images
Ports Profile

This Software is Not for Operational Use

Sea conditions analysis

- Need to understand potential requirement to operate in variety of sea conditions
- Study undertaken to gather sea conditions data
- Benefits:
 - Define requirement for sea condition reduction technologies
 - Provide input to analysis of technology options against requirement
 - Potential to provide input to other studies

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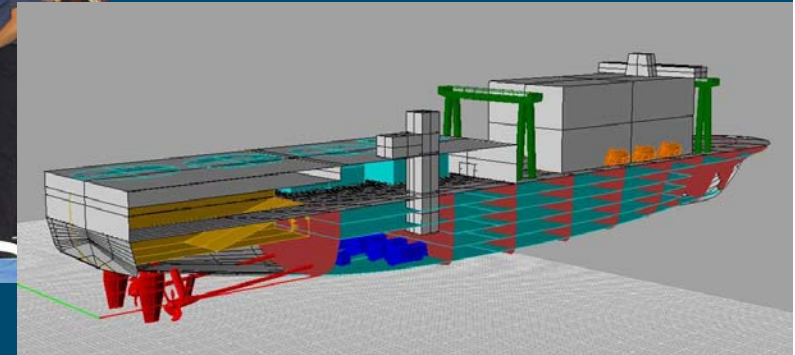
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Options assessment



Analysis approach

- Dstl MarFlow model
 - Data driven, generic process model
 - Previously used in a variety of studies



MarFlow modelling concepts

- **Stock Items** = Objects to be supplied
- **Route** = Sequence of steps by which stock items travel
- **Resources** = Assets required by the stock item during each step
 - Limited in number

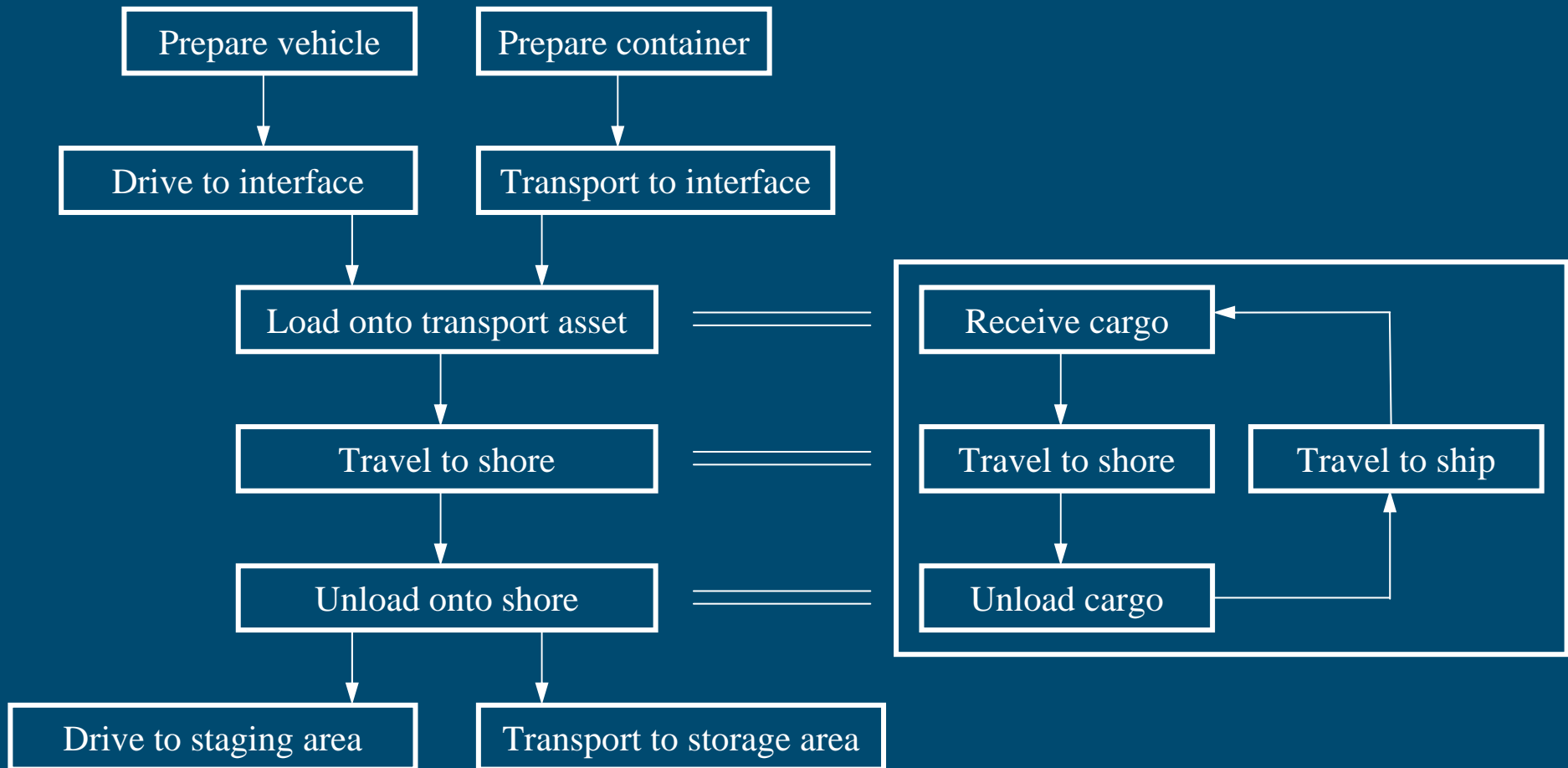
Stock items

- Variable number of stock item types
- Demand or arrival of stock items expressed as a schedule
- Each schedule entry requests one or more stock items, of one or more type

Routes

- Route for each stock type broken down into a number of steps
- For each step, define:
 - Resources and time required (may vary by stock type)
 - Time may be expressed as distribution
 - Rule for selecting next step
 - Probability
 - Condition (e.g. choose step with shortest queue)

Routes



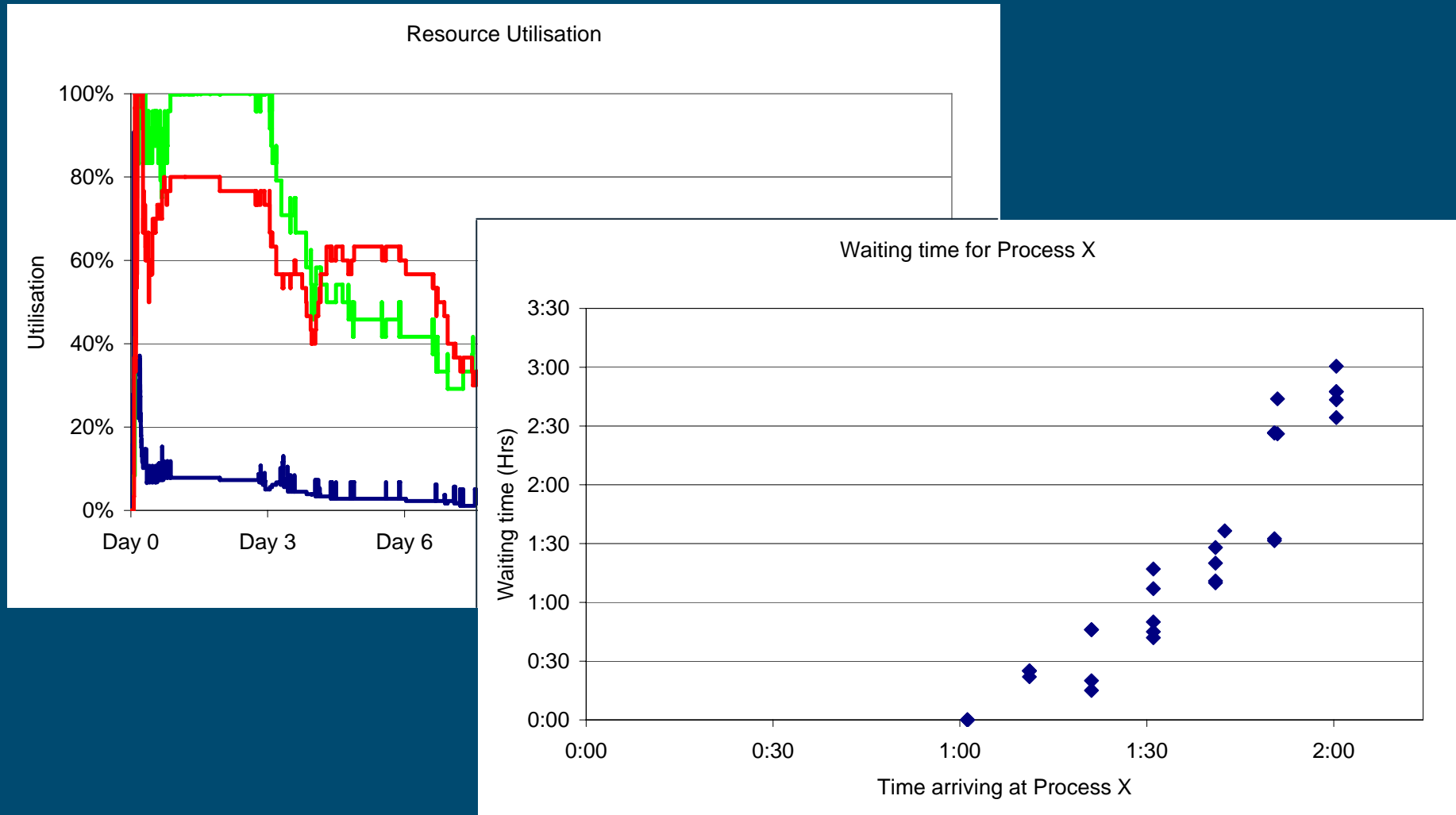
Resources

- Total number of resources available specified
- In general, a resource may be:
 - Re-usable immediately after use
 - Re-usable, but only after a certain time
 - Consumable - cannot be re-used
- More than one type of resource may be able to do a particular job, particular resource may be preferred
- Resources arranged in sets: model allows resources to be chosen in a preferred order

Model outputs

- Total time taken for offload
- Resource utilisation over time
- Queuing information
- Details of routes taken for individual stock items

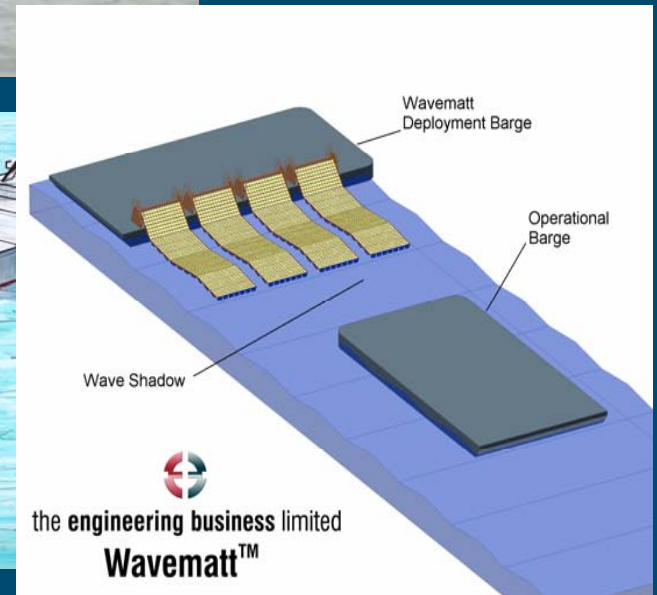
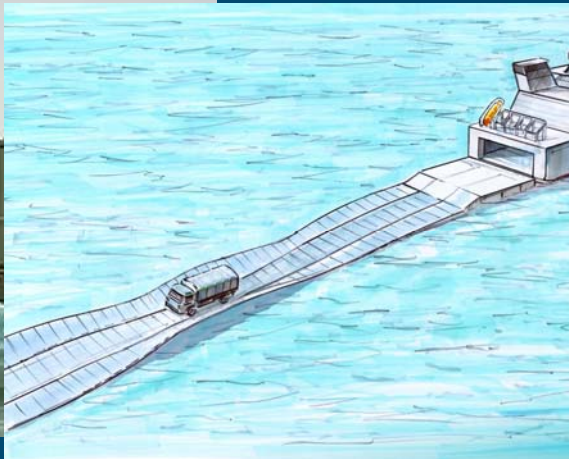
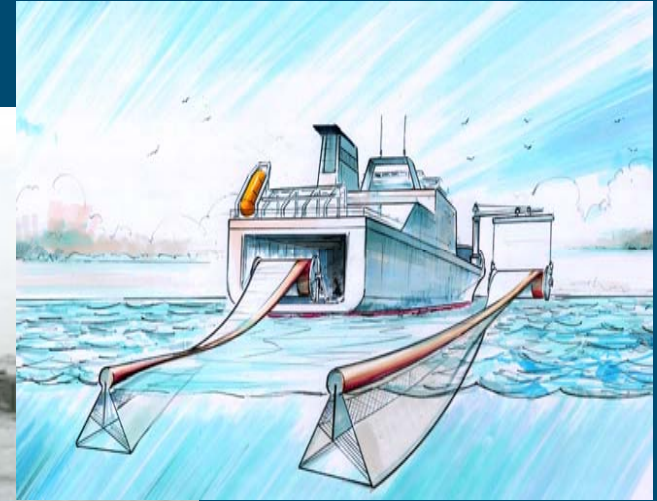
Example outputs



MarFLOW validation

- Gather real life / representative data
 - Includes understanding how system works
- Implement data in MarFLOW
- Present results to a military panel
 - Iterative process

Technology options



Options assessment

- Select mixes of technology options to assess
- Baseline analysis:
 - Use model outputs to assess ability of option mixes to meet defined requirement in a range of scenarios
- Sensitivity analysis:
 - Vary inputs (e.g. port austerity, sea conditions) and use model outputs to ensure that baseline analysis is robust to changes

Littoral Watercraft study

- Watercraft options may have wider utility
 - Surface Manoeuvre assault
 - Surface Manoeuvre sustain
 - Maritime Intra Theatre Lift
- Roles have distinct requirements with a varying degree of overlap
- Equipment being procured for some roles but not others
 - Implicit assumption that assets will be shared between roles
- Analysis required to test validity of this assumption
 - Take into account concurrency issues and overall requirement

Littoral Watercraft study

- MSc student investigating potential analysis approaches
 - Dissertation due end September 06
- Analysis approach:
 - Identify role / watercraft mapping
 - Define scenario as list of roles with associated time and location
 - Find best assignment of watercraft to roles, taking into account:
 - Suitability of watercraft for role
 - Concurrency of roles
 - Transport of watercraft between roles

Summary

- Requirement exists to offload in ports of varying austerity
- Analysis being conducted:
 - Define requirement
 - Assess option mixes against requirement
- Littoral watercraft study will consider wider use



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Questions

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